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CLINICAL AID

Orthograde Ultrasonic Retrieval of Root Canal Obstructions

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A variety of items must be removed from root canals. A review of the retrieval techniques which have evolved are presented along with examples illustrating the use of ultrasonic energy to remove foreign objects from canals.

An eclectic array of objects are introduced into root canals. Some of these items such as obturation materials or posts are inserted intentionally while many others are introduced inadvertently. Retrieval of intracanal obstructions may be difficult but essential if nonsurgical retreatment is necessary. Fortunately, a number of ingenious instruments and techniques have evolved which enable successful orthograde retrieval of foreign articles.

Unintentional iatrogenic inclusion of various articles into root canals has been reported. These include absorbent points (1), burs (2, 3), files (4–6), glass beads (7), and amalgam or gold filings (3, 8). In addition, patients may block root canals in teeth which have been left open to drain. Grossman (1) discovered small nails and an indelible ink pencil tip in canals. He also reported finding a toothpick in a canal and a tomato seed in the periapex. (The seed sprouted upon its removal!) Zillich and Pickens (9) retrieved a hat pin and Turner (10) removed a dress maker's pin which had broken in a tooth. Nemst (11), Harris (12), and Lamster and Barenic (13) described finding needles and pins, pencil lead, and other metal objects in canals.

Attempted removal of these foreign objects has spawned the development of several devices, instruments, and techniques which aid in the retrieval of canal obstructions.

Feldman et al. (6) described techniques that they use. The first is to bypass an object, instrument adequately, and seal the object in the canal. Loose fragments may be removed with a broach wrapped in cotton. Another method is to prepare a trench around the item with a half round bur and then to use splinter forceps. "Rasps" are recommended for removal of large fragments. Grooves in the fragments are engaged and fragments are extracted as the rasp is withdrawn.

Feldman et al. (6) also described a modification of a technique developed by Masserann (14). They use Gates Glidden burs, trepan burs, and extractors, aided by fiber optics to remove items. They stated that "canals must be straight and wide enough to accommodate the rigid extractor" (6). Dimashkieh (15) described a special set of drills comprised of mandrels with end-cutting tubes and matching twist drills for use in conjunction with guiding sleeves. Warren and Gutmann (16) reviewed the technique for removal of posts or dowels with a Post Puller designed by Dr. H. Kahn. Gerstein and Weine (17) used specially prepared burs to remove silver cones and fractured dowels. A 700R tapered fissure bur was altered so that it was end-cutting only. This permitted a trench to be made around objects without cutting them. Fragments were then grasped with Steiglitz forceps or fork-shaped spoons and removed.

Roig-Green (18) described a device which consists of a 25-gauge needle, fishing leader wire, and a small mosquito hemostat. The intended use for this device was to remove objects not tightly bound in canals.

Fors and Berg (4) outlined an armamentarium for removing broken endodontic instruments. They used long burs with extra long and very thin shanks and a modified needle holder used in microsurgery by ophthalmologists.

More recently ultrasonics has been utilized to removed solid objects from the pulp space. Gaffney et al. (19) removed zinc oxide-eugenol and zinc phosphate from around cemented silver cones or endodontic instruments with a Cavitron tip. The tip was then placed directly in contact with the object to be removed until the ultrasonic vibration loosened the object. Sieraski and Zillich (20) described a case where they removed a silver point with an ultrasonic scaler after attempts

using other methods had failed. One of the authors (B.C.) modified this approach by attaching an endodontic file to the Cavitron tip and transferring vibrations via the file (this was before endosonic systems were available). Krell et al. (21) recommended that a Hedstrom file be worked alongside silver cones and then an ultrasonic scaler be placed on the shank of the file until the silver cone "backs out." They pointed out that the use of the ultrasonic scaler alone or in combination with other techniques offered the advantages of conservation of tooth structure, avoidance of surgical treatment, and saving time.

After endosonics was introduced a few years ago, Souyave et al. (5) removed multiple broken instruments from three canals using a Scalatron unit and ordinary handleless 25-mm K files. The broken instruments were bypassed with #10 files, and the canals were instrumented up to #25. Then Giro-files were used in the endosonic handpiece and worked in the canals until the instrument fragments had been "shaken" loose and extruded. The authors stressed that this technique was "extremely conservative in dentin loss and caries a low risk of lateral perforation" (5).

Meidinger and Kabes (3) used a Cavi-Endo unit to dislodge the head of a #170-L bur which had broken and lodged in a canal. They said that the bur "came floating out with the irrigant" (3). They also used endosonics to successfully remove amalgam particles which had become lodged in a canal. Stamos et al. (8) removed packed gold or amalgam filings, silver points, and posts with the Cavi-Endo system. Some additional examples of ultrasonic retrieval of root canal obstructions follows.

EXAMPLES 1 AND 2

In both instances instrument separation occurred during a laboratory investigation into the performance of endosonics in curved canals (22) (Figs. 1 and 2). A Cavi-Endo unit was used as the power source and #15 files were worked to and alongside the fragments. Copious irrigation (water) and gentle up and down strokes were used until the fragments "floated" out as described by Meidinger and Kabes (3) and Stamos et al. (8).

EXAMPLE 3

A failing endodontic case requiring retreatment (Fig. 3) presented at the University of Saskatchewan's College of Dentistry. A student's attempts to bypass and remove a radiopaque obstruction were unsuccessful. An instructor inserted an endosonic file to and alongside the obstruction and with ultrasonic vibrations and copious irrigation removed what appeared to be the tip of an endodontic spreader.

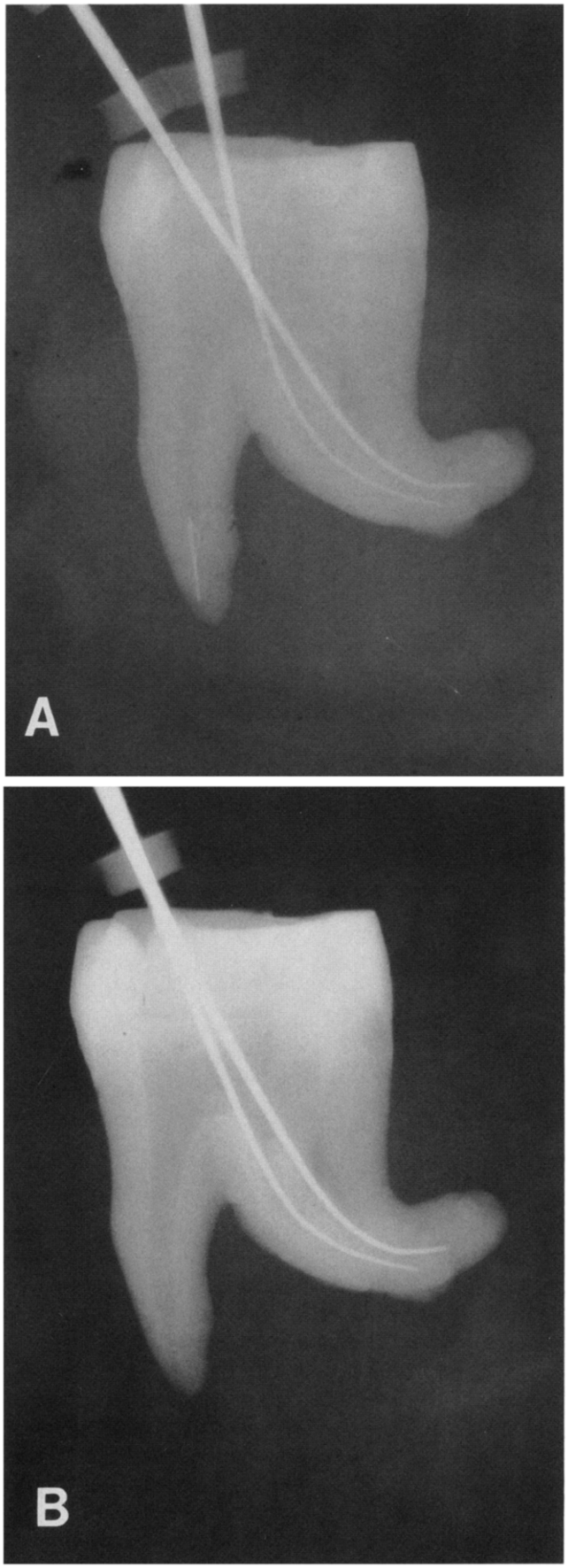

FIG 1. Case 1. *A*, Instruments separated in lingual canal. *B*, Fragment removed with endosonics.

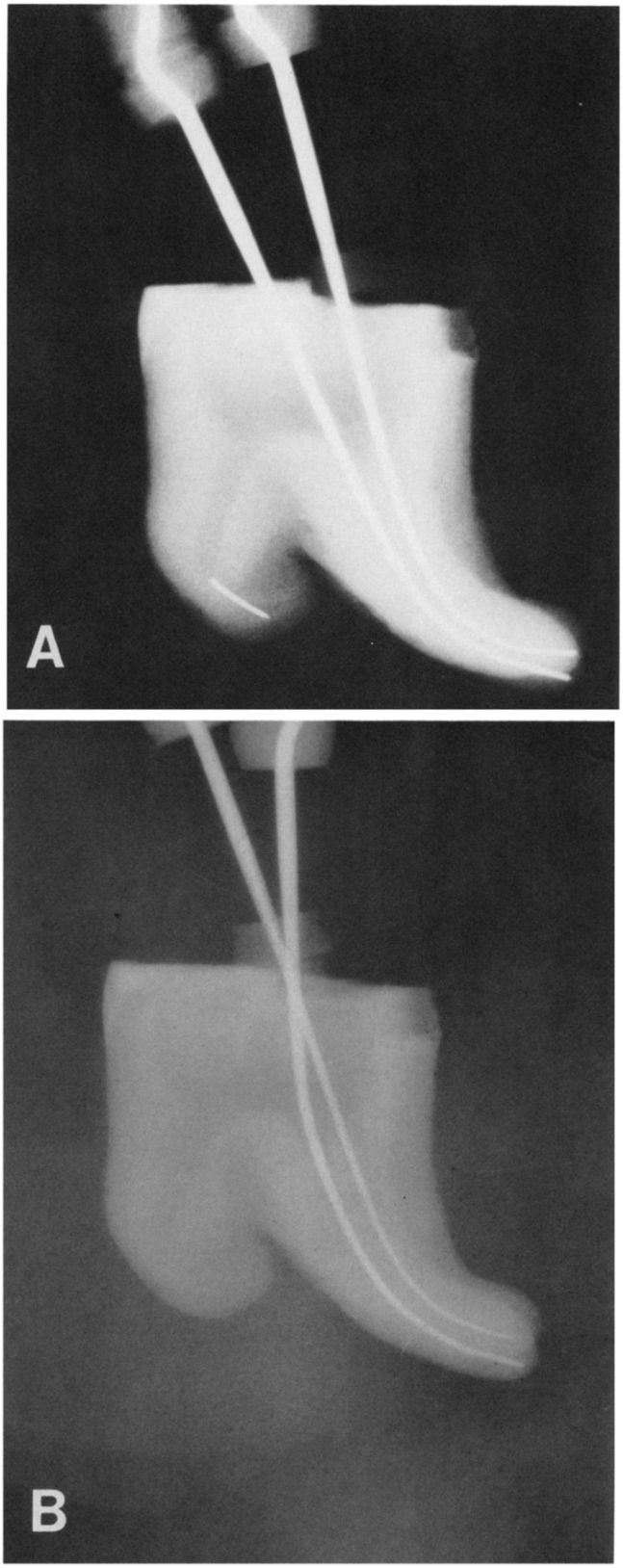

FIG 2. Case 2. *A*, File fractured at curve. *B*, File removed with endosonics.

EXAMPLE 4

A preoperative radiograph revealed inadequate obturation of canals with silver cones, which were cut off well down into the canals (Fig. 4). The short cone was vibrated loose easily with endosonics. The longer cone was loosened but did not "float out" of the canal. A technique suggested by Dr. Gerstein (personal communication) was tried successfully. Three #20 K-Flex files were inserted alongside the loosened silver cone. They were braided and twisted around the cone and then withdrawn. The silver cone, entangled in the twisted files, was retrieved. Size 20 files were used as they were small enough for three of them to be accommodated and because small sized K files have excellent torsional properties (23).

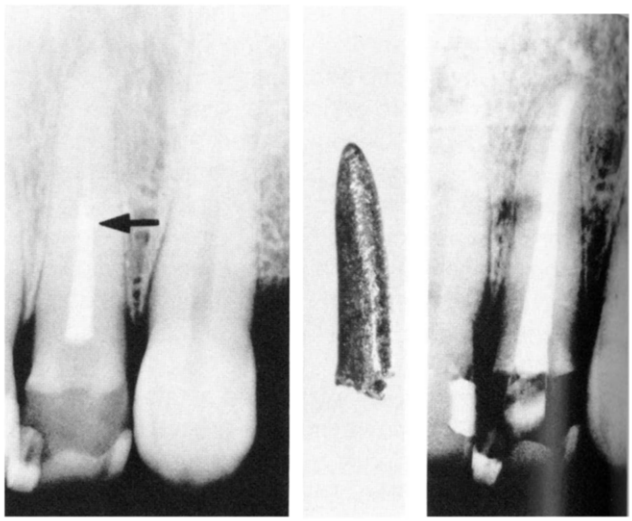

FIG 3. Case 3. The *arrow* indicates a radiopaque object in the canal. The object, probably the tip of a spreader, was removed with endosonics and the canal was then obturated.

EXAMPLE 5

A patient requested treatment for a lower molar. Endodontics had been previously attempted but the operator had broken two files and a bur in the mesial canals. Size 15 endosonic files were patiently used to work to and alongside these foreign objects. Copious irrigation and gentle up and down strokes were used to loosen debris. The bur tip and one broken file came "floating out" of the canals and one file remained (Fig 5). The canals were reinstrumented and at a subsequent appointment filled. The patient has remained asymptomatic.

SUMMARY

There are a number of miscellaneous items which either intentionally or otherwise find their way into root canals. Several retrieval techniques, most of which involve excessive removal of dentin, have evolved. Endosonics has been found to be a very useful adjunct in the retrieval armamentarium. Its major advantage is that it, in many cases, enables orthograde (nonsurgical) removal of canal obstructions without weakening teeth by excessive dentin removal. We have been successful

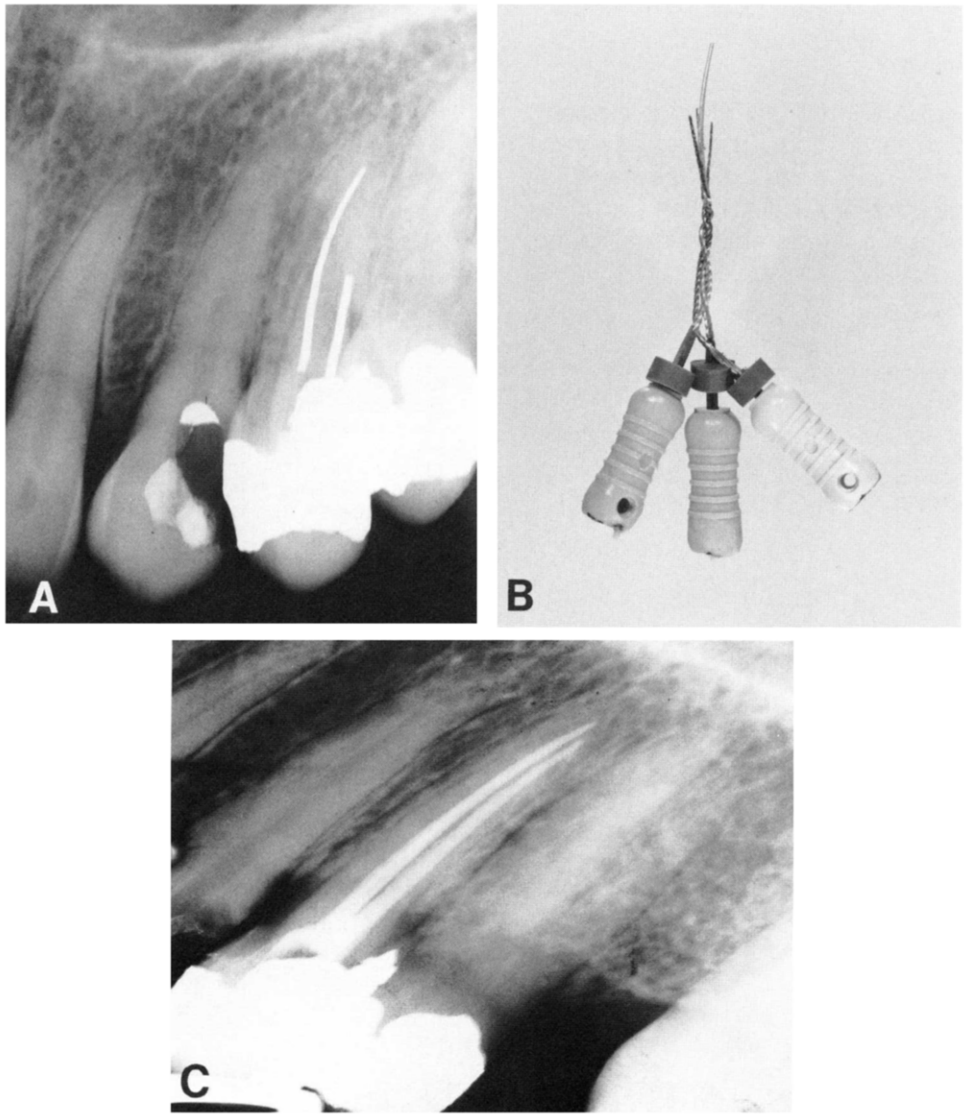

FIG 4. Case 4. *A*, Silver cones cut off well into canals. These were loosened with endosonics. *B*, Files braided around silver cone and withdrawn from canal. *C*, Postobturation radiograph.

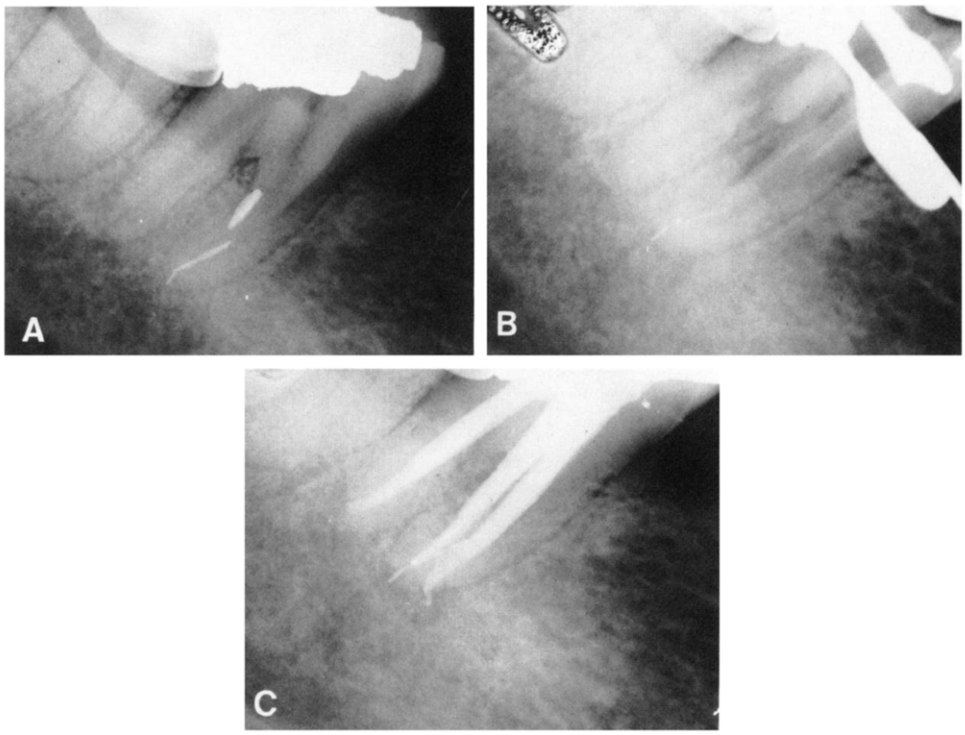

FIG 5. Case 5. *A*, Preoperative radiograph revealing a broken bur and some file segments. *B*, Bur and a file segment removed with endosonics. *C*, Postobturation radiograph.

in attempts to remove difficult obstructions in many, but not all, attempted cases. Some items are easily and quickly removed; others require more time and patience. Endosonics alone or in combination with other techniques is very useful in the retrieval of canal obstructions.

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References

1. Grossman LI. Endodontic case reports. Dent Clin North Am 1974;18:509–27.
2. Sternberg RN. Retrieval of broken instruments from root canal. Oral Surg 1977;44:325.
3. Meidinger D, Kabes B. Foreign object removal utilizing the Cavi-Endo ultrasonic instrument. J Endodon 1985;11:301–4.
4. Fors UG, Berg JO. A method for the removal of broken endodontic instruments from root canals. J Endodon 1983;9:156–9.
5. Souyave LC, Inglis AT, Alcalay M. Removal of fractured endodontic instruments using ultrasonics. Br Dent J 1985;159:251–3.
6. Feldman G, Solomon C, Notaro P, Moskowitze E. Retrieving broken endodontic instruments. J Am Dent Assoc 1974;88:588–91.
7. Shay J. Foreign body in a tooth. Oral Surg 1985;59:431.
8. Stamos D, Haasch G, Chenail B, Gerstein H. Endosonics: clinical impressions. J Endodon 1985;11:181–7.
9. Zillich RM, Pickens TN. Patient induced blockage of the root canal. Oral Surg 1982;54:689–90.
10. Turner CH. An unusual foreign body. Oral Surg 1983;56:226.
11. Nernst H. Foreign body in a root canal. Quintessence Int 1972;85:33–4.
12. Harris WE. Foreign bodies in root canals: report of two cases. J Am Dent Assoc 1972;85:906–11.
13. Lamster IB, Barenie JT. Foreign objects in the root canal. Oral Surg 1972;44:483–6.
14. Williams VD, Bjorndal AM. The Masserann technique for the removal of fractured posts in endodontically treated teeth. J Prosthet Dent 1983;49:46–8.
15. Dimashkieh MR. The management of obstructed root canals. The hollow tube technique. Br Dent J 1975;138:459–63.
16. Warren SR, Gutmann JL. Simplified method for removing intraradicular posts. J Prosthet Dent 1979;42:353–6.
17. Gerstein H, Weine FS. Specially prepared burs to remove silver cones and fractured dowels. J Endodon 1977;11:408–10.
18. Roig-Greene J. The retrieval of foreign objects from root canals: simple aid. J Endodon 1983;9:394–7.
19. Gaffney JL, Lehman JW, Miles MJ. Expanded use of the ultrasonic scaler. J Endodon 1981;7:228–9.
20. Sieraski SM, Zillich RM. Silver point retreatment: review and case report. J Endodon 1983;9:35–9.
21. Krell KV, Fuller MW, Scott GL. The conservative retrieval of silver cones in difficult cases. J Endodon 1984;10:269–73.
22. Chenail BL, Teplitsky PE. Endosonics in curved canals. J Endodon 1985;11:369–74.
23. Krupp JD, Brantley WA, Gerstein H. An investigation of the torsional and bending properties of seven brands of endodontic files. J Endodon 1984;10:372–80.